

What is claimed is:

5 1. A multilayered gas sensing element comprising:  
laminated layers comprising a zirconia-series solid electrolytic sheet and  
an alumina-series insulating sheet,  
a bonding boundary intervening between said zirconia-series solid  
electrolytic sheet and said alumina-series insulating sheet, and  
said bonding boundary including at least partly a crystal phase containing  
silicon dioxide.

10 2. The multilayered gas sensing element in accordance with claim 1, where  
said crystal phase further contains at least one component selected from the  
group consisting of calcium oxide, magnesium oxide, barium oxide, and  
strontium oxide.

15 3. The multilayered gas sensing element in accordance with claim 1, where  
said bonding boundary between said zirconia-series solid electrolytic sheet and  
said alumina-series insulating sheet is undulated.

20 4. The multilayered gas sensing element in accordance with claim 1, where  
a crystal lattice of said zirconia-series solid electrolytic sheet is connected to a  
crystal lattice of said alumina-series insulating sheet in said bonding  
boundary.

25 5. The multilayered gas sensing element in accordance with claim 1, where  
a thermal expansion coefficient difference between said zirconia-series solid  
electrolytic sheet and said alumina-series insulating sheet is equal to or less than  
 $2 \times 10^{-6}$ .

30 6. The multilayered gas sensing element in accordance with claim 1, where  
a sintering contraction coefficient difference between said zirconia-series solid

Q1  
Confidential  
electrolytic sheet and said alumina-series insulating sheet is equal to or less than 3%.

5 7. A method for manufacturing a multilayered gas sensing element, comprising the steps of:

preparing a zirconia-series green sheet containing silicon dioxide and aluminum oxide for forming a solid electrolytic sheet;

preparing an alumina-series green sheet for forming an insulating sheet;

10 bonding said zirconia-series green sheet and said alumina-series green sheet to constitute an unburnt laminated body; and

sintering said unburnt laminated body.

8. The method for manufacturing a multilayered gas sensing element in accordance with claim 7, wherein said zirconia-series green sheet contains silicon dioxide by 0.05 to 4 in weight part and aluminum oxide by 0.5 to 4 in weight part when zirconia material is 100 in weight part, with a sum of silicon dioxide and aluminum oxide being not larger than 4 in weight part.

20 9. A method for manufacturing a multilayered gas sensing element, comprising the steps of:

preparing a zirconia-series green sheet for forming a solid electrolytic sheet;

25 preparing an alumina-series green sheet containing silicon dioxide for forming an insulating sheet;

bonding said zirconia-series green sheet and said alumina-series green sheet to constitute an unburnt laminated body; and

sintering said unburnt laminated body.

30 10. The method for manufacturing a multilayered gas sensing element in accordance with claim 9, wherein said alumina-series green sheet contains silicon dioxide by 0.05 to 10 in weight part when alumina material is 100 in

weight part.

11. A method for manufacturing a multilayered gas sensing element, comprising the steps of:

5 preparing a zirconia-series green sheet containing silicon dioxide and aluminum oxide for forming a solid electrolytic sheet;

preparing an alumina-series green sheet containing silicon dioxide for forming an insulating sheet;

10 bonding said zirconia-series green sheet and said alumina-series green sheet to constitute an unburnt laminated body; and  
sintering said unburnt laminated body.

12. The method for manufacturing a multilayered gas sensing element in accordance with claim 11, wherein

said zirconia-series green sheet contains silicon dioxide by 0.05 to 4 in weight part and aluminum oxide by 0.5 to 4 in weight part when zirconia material is 100 in weight part, with a sum of silicon dioxide and aluminum oxide being not larger than 4 in weight part, and

said alumina-series green sheet contains silicon dioxide by 0.05 to 10 in weight part when alumina material is 100 in weight part.

add a27